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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/784,800	02/15/2001	Joseph S. Gordon	064441.0207	2724

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EXAMINER

CHANG, AUDREY Y

ART UNIT	PAPER NUMBER
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2872

DATE MAILED: 03/27/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/784,800

Applicant(s)

GORDON ET AL.

Examiner

Audrey Y. Chang

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-- Th MAILING DATE of this communication appears on th cover sheet with th correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on January 6, 2003.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 7-30 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 7-30 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____
- 4) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on **January 6, 2003** has been entered.

2. This Office Action is also in response to applicant's amendment filed on December 9, 2002, which has been entered as paper number 9.

3. By this amendment, the applicant has amended claims 7-9, 12, 17-19, 21, 26, and 29.

4. Claims 7-30 remain pending in this application.

Claim Rejections - 35 USC § 112

5. **Claims 7-30 rejected under 35 U.S.C. 112, first paragraph**, as containing subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention. The specification fails to teach how could the "a peak in transmission for normal incidence light at a wavelength greater than an exposure wavelength" could be achieved. The specification *discloses* only spectrum for with normal incident (angle of incidence at zero) for using the light with "*exposure wavelength*", (please see Figure 5). It is not clear how to deduce from the spectrum that the peak transmission for normal incident is at wavelength **greater** than the exposure wavelength. The spectrum for light having wavelength not equal to the exposure wavelength simply cannot be measured. This statement therefore is wrong and needed to be explained more. Claims 8-16, 18-25 and 27-30 inherit the rejection from their respective based claim.

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6. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

7. **Claims 8 and 18 are rejected under 35 U.S.C. 112, second paragraph**, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

The phrase “increasing the optical thickness over a design thickness by less than or equal to approximately one-quarter of the exposure wavelength” recited in claims 8 and 18 are confusing and indefinite since it is not clear what exactly is the final thickness of the film. It is not sure if these claims mean certain “increasing” action is performed on the thickness of the film in order to achieve the maximizing effect. Clarifications are required.

Claim Rejections - 35 USC § 102

8. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

9. **Claims 7-9, 17, 18, 19 and 26 are rejected under 35 U.S.C. 102(b) as being anticipated by the patent issued to Nose et al (PN. 5,742,386).**

Nose et al teaches an *exposure system* for detecting foreign matter that is comprised of a *pellicle* (50), that is comprised of a *thin film*, fixed to a *pellicle frame* (51), made of *aluminum*, in order to cover a pattern portion on a *photomask* (52), (please see Figures 1 and 6, column 1, lines 44-54 and column 4).

Nose et al teaches that the pellicle with the thin film, having certain optical thickness, is capable of making the peaks of transmission of the light with incident angles at *off axis* (such as 10⁰, 30⁰, 60⁰ as

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shown in Figure 7) to be at *100 percent*. This pellicle with thin film therefore is capable of *maximizing* the transmission of light at off axis at an exposure wavelength.

With regard to the features concerning the thin film produces a transmission maxima at a wavelength between one nanometer to twenty nanometer above the exposure wavelength, since the “exposure wavelength” is arbitrary defined in the incident application, the condition is implicitly met by identifying the exposure wavelength to always meet with the condition.

With regard to the feature concerning that the optical thickness of the pellicle film produces a peak in transmission for normal incident light at a wavelength **greater** than an exposure wavelength, wherein the optical thickness also contributes to maximize transmission of the light having exposure wavelength at an incident angle greater than zero. Nose et al teaches that by varying the optical thickness of the pellicle film the maximized transmittance of the light of an exposure wavelength can be achieved at incident angles greater than zero as shown in Figure 7. Although this reference does not teach explicitly that for these thicknesses the transmittance of the normal incident will occur at wavelengths greater than the exposure wavelength, however such feature is implicitly included. Since it is known in the art that the maximum transmittance of the pellicle film for normal incident is determined by the equation: $m * \lambda = (2 * n) * d$, with m being an integer, λ being the exposure wavelength, n being the refractive index of the pellicle film and d being the thickness of the film. It can be easily calculated that for $n = 1.5$ and the thickness d being $0.86 \mu\text{m}$ the wavelengths for having peak of transmission at normal incident is greater than the exposure wavelength $0.488 \mu\text{m}$, (as referred to Figure 7). By a simple calculation, the peak of transmission for normal incident could occur for light having wavelength of $0.51 \mu\text{m}$. Furthermore, Nose et al teaches that for a film thickness of $0.86 \mu\text{m}$, the pellicle is capable of creating peaks of transmission (100% transmission) for light with off-axis angles of incident. Although this reference does not teach explicitly that the film thickness is equal to one-quarter of the exposure wavelength plus a design thickness, however such feature is implicitly met since one-quarter of the exposure wavelength as shown

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in Figure 7 of Nose is 0.122 μm . The film thickness is 0.86 μm , which means the film thickness is equal to 0.122 μm plus 0.738 μm with 0.738 μm being designated as the “design thickness”.

This reference has therefore anticipated the claims.

Claim Rejections - 35 USC § 103

10. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

11. **Claim 16 is rejected under 35 U.S.C. 103(a) as being unpatentable over the patent issued to Nose et al.**

The exposure system with a pellicle taught by Nose et al as described for claim 7 above has met all the limitations of the claim. Nose et al teaches that the thickness of the thin film is about 0.86 μm , which is about 860 nanometers. Nose et al teaches that the exposure wavelength is about 0.488 μm or 488 nanometer, (please see Figure 7), but it does not teach explicitly that the exposure wavelength is between the 248 and 436 nm. However the specification fails to teach the criticality of having these particular wavelengths would overcome any problem in the prior art and it is well known in the art that the pellicle may include thin film material having a plurality of transmission peaks that include wavelengths higher than 436 nm, it would then have been obvious matter of design choice to one skilled in the art to modify the thin film to be operable with exposure light of the claimed wavelength range.

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12. Claims 10-15, 20-25 and 27-30 are rejected under 35 U.S.C. 103(a) as being unpatentable over the patent issued to Nose et al in view of the patent issued to Fukumitsu et al (PN. 4,657,805).

The exposure apparatus including a pellicle having a thin film taught by Nose et al as described for claims 7, 17 and 26 above has met all the limitations of the claims. This reference however does not teach explicitly to include anti-reflective coatings on the pellicle. Fukumitsu et al in the same field of endeavor teaches a dust cover for photomask reticle wherein the dust cover comprises a thin film (1) and an anti-reflective coating (3) on the top and bottom surfaces of the thin film, (please see Figures 1 and 2). Fukumitsu et al teaches that the anti-reflective coating has a thickness of about quarter of the design wavelength and has a refractive index that is a square root of the refractive index of the thin film (1), which is therefore different from the refractive index of the thin film, (please see column 5, lines 8-50). With regard to claim 15, Fukumitsu et al teaches that the thin film may comprise fluoropolymers, (please see column 5). It would then have been obvious to one skilled in the art to apply the teachings of Fukumitsu et al to add anti-reflective coating on top and bottom of the thin film pellicle of Nose et al for the benefit of improving the transmittance of the pellicle.

With regard to the features concerning the thin film produces a transmission maxima at a wavelength between one nanometer to twenty nanometer above the exposure wavelength, since the "exposure wavelength" is arbitrary defined, the condition is implicitly met by identifying the exposure wavelength to always meet with the condition.

Response to Arguments

13. Applicant's arguments, filed on December 9, 2002, have been fully considered and they are not persuasive. The newly amended claims have been fully considered and they are rejected for the reasons stated above.

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14. In response to applicant's arguments which state that the equation which determines the maximum transmittance of the pellicle film, $m \cdot \lambda = 2 \cdot n \cdot d$, is not well known in the art and can only be deduced from the specification of the instant application, the examiner respectfully disagrees and invites the applicant to check any general textbook for optics under theory of diffraction. The examiner respectfully invites the applicant to the explicitly teachings by Kino et al (US Patent 5,073,018) about the diffraction phenomenon for thin film pellicle. Kino et al teaches that the optical path difference (D) introduces by the pellicle is defined as $D = 2 \cdot n \cdot h / \cos \theta_t$, (equation 4), with n is the index refraction of the film, h is the thickness of the film and θ_t is the angle of refraction inside the film, (please see Figures 2 and 4). The phase difference introduces by such is $\delta = D(2\pi/\lambda)$ (equation 5), with λ being the wavelength of the exposure. Maximum transmission peaks occurs when the phase difference is an integer multiple of 2π , this means $\delta = m \cdot 2\pi$ is the condition for maximum transmission peaks to occur. One can then deduce from this that $h = m \cdot \lambda \cdot \cos \theta_t / (2 \cdot n)$. Kino et al also teaches that the angle of incident relates to the angle of refraction is defined by $\sin \theta_t = n \cdot \sin \theta_i$ (Snell's Law). From these equations and from Figure 7 of Nose one can deduce (with $h = 0.86 \mu\text{m}$, $\lambda = 0.488 \mu\text{m}$, $n = 1.5$ and the angle of incident θ such as 13 degrees) that the peak transmission wavelength for normal incident for this pellicle is about $0.51 \mu\text{m}$. The feature concerning the peak transmission for normal incident occurs at wavelength greater than the exposure wavelength ($0.488 \mu\text{m}$) is therefore implicitly met by the Nose reference.

15. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Audrey Y. Chang whose telephone number is 703-305-6208. The examiner can normally be reached on Monday-Friday (8:00-4:30), alternative Mondays off.

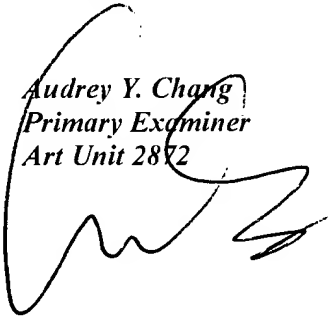
If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Cassandra Spyrou can be reached on 703-308-1637. The fax phone numbers for the organization where

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this application or proceeding is assigned are 703-872-9318 for regular communications and 703-872-9319 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0956.

Audrey Y. Chang
Primary Examiner
Art Unit 2872



A. Chang, Ph.D.
March 20, 2003